

SECTION I

Summary:

The purpose of the ERC at the University of Cincinnati is to provide an excellent interdisciplinary educational environment for graduate students in core (Occupational Hygiene, Occupational Health Nursing, Occupational Medicine Residency) and component (Biomonitoring) training programs. Occupational Hygiene program has two tracks: Comprehensive Practice and Occupational Safety and Ergonomics. Cincinnati ERC also supports the development of research skills through Pilot Research Program (PRP) and Targeted Research Training (TRT) program; encourage innovative and interdisciplinary research to identify causal relationships between exposure and illness or injury, design control strategies and evaluate the effectiveness of interventions; deliver continuing education, consultation and outreach to address environmental and occupational safety and health needs through regional partnerships; and advocate the translation of research findings into practice regionally, nationally and internationally. This is accomplished through a collaboration of faculty from the Colleges of Medicine and Nursing. College of Engineering participates in the TRT Program. The ERC leadership seeks input from an External Advisory Board, which represents key stakeholders.

Academic program trainees have been accepted into MS and PhD graduate programs in their respective Colleges and Departments. Non-academic program trainees in the PRP represent graduate students, junior faculty or senior faculty transitioning into occupational safety and health. Trainees in Continuing education and outreach span the range of educational backgrounds and employment, as the program reaches practitioners in all disciplines as well as employees with health and safety responsibilities in diverse work settings. The TRT involves faculty and students in all academic programs to provide a safer and more healthful workplace in regionally important employment sectors: firefighters and emergency responders, low wage workers and health care workers. The PRP symposium and the annual topical symposium are open to the community providing an opportunity for more than 100 professionals to interact with the investigators. The annual Research Capacity Building Workshop is offered for 15-20 junior investigators from PRP institutions.

Classroom and laboratory facilities are available in each College. Practicum locations are arranged with various employers. Substantial field work is done by all disciplines, utilizing local workplaces for walk-throughs, evaluation of potential work place exposures, multi-disciplinary workshop projects, research-to-practice projects and occupational medicine resident placements.

Relevance:

Occupational injury and illness adds substantially to health care costs. The educational programs offered by the ERC prepare professionals to serve in their respective roles on the health and safety team – identifying hazardous exposures, reducing risk and treating injury and illness. Through outreach students translate research to practice and learn of the need for continuing education as part of life-long learning.

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SECTION II: Program highlights

Pilot Research Project Training Program (PRP)

The PRP at the University of Cincinnati thrives in increasing the research capacity of research trainees and young investigators in occupational health and safety and encouraging those in related disciplines to pursue occupational health and safety research. Since 1999, the PRP program has awarded close to \$1 million in pilot grants that have resulted in bringing close to \$30 million in additional research support to the region. Additionally, it has facilitated the transition of 27 new investigators from other disciplines to occupational health and safety field.

The pilot projects have resulted in research-to-practice applications that help the surrounding community. For example, an occupational health nursing student carried out a study to determine if a program of Tai Chi is beneficial to maintain an optimal level of cardiac health with improved balance and lower body strength among fire fighters. Thirty two firefighters received Tai Chi instruction once a week over a 10 week period, at their worksite. Measures of blood pressure, pulse, lower body strength, and percentage of body fat were collected at the beginning of the study, at midpoint, and at the completion of the study. Preliminary analysis shows that Tai Chi practice on average had a 13 point decrease in systolic and 10 point decrease in diastolic blood pressure. Plans are underway to expand this program as several other local fire departments have asked to be part of the activity.

Targeted Research Training (TRT)

In the TRT program students from all ERC disciplines have worked together to investigate the cardiovascular risk factors among firefighters. One project is focused on early signs of effects of heat stress in firefighters. Data collection occurs during live fire training and includes continuous core body temperature measurement using FDA approved radio pill and heart rate monitoring using Polar heart rate belt. In the long-term, the heat stress study will have a positive impact as the data forms the basis for developing early alert system to minimize heat strain incidents. Availability of real-time monitoring system along with validated physiological criteria will permit Fire Chiefs to make appropriate and timely decision to limit “heat strain” and thereby minimizing casualties among firefighters at the fire scene.

In another project, a PhD student assessed the efficiency of firefighters’ respirators against combustion-generated particles. Combustion material was found to have significant effect on the penetration of particles into an elastomeric respirator. Among plastic, paper and wood materials, particles originating from plastic were found to have higher penetration than those originating from paper or wood combustion. This has important implications for the performance evaluation protocols for respirators used by firefighters and first responders. The results were reported in the International Respiratory Protection conference.

Outreach

One of the main initiatives in the outreach is the continual collaboration with the Interfaith Workers Center where trainees and faculty have continued providing health and safety information. One such initiative was the demonstration for support of fair wages for tomato workers at a large grocery store company. The team has continued to supply health and safety Quick Cards for the bulletin board, with a concentration on the restaurant industry. The information is offered in English and Spanish.

Health Care Ergonomics

Nurses at University of Cincinnati hospital were trained in safe patient handling. Based on previous research, the training has focused on champions in the different units of the hospital by

providing hands-on interaction with lifts. Follow-up will show how the trends in injury data are affected by the increased knowledge of the lifts and usage on the units.

Ergonomic expertise is also being provided to a major manufacturer of hospital beds. The goal is to improve bed design to minimize the impact on patients and caregivers. The collaboration has yielded changes in the design of several beds and stretchers that will potentially reduce the stress on the caregiver, improve the comfort of the patient, and improve the product functionality. Improved products with respect to ergonomics and patient safety are expected to increase sales.

Respiratory Protection

ERC faculty and students have long-standing research program in the area of respiratory protection including the development and evaluation of respiratory protection devices. State-of-the-art experimental facilities have been developed in their laboratories and used for testing commercially available and newly developed respirators. The faculty helped develop and evaluate respirators that minimize the face seal leakage by using peripheral or pressurized adhesives. Some of these respirators are now commercially available and received NIOSH respirator certification. Some prototypes are being explored by the US Department of Defense for military applications.

Health Effects of Occupational Exposures

Researchers at the Cincinnati ERC have investigated the health effects of diacetyl exposure in popcorn manufacturing facilities. Previously, elevated levels of diacetyl exposure have been associated with airway obstruction including the pulmonary condition bronchiolitis obliterans. The data collected by Cincinnati ERC faculty are being used to help determine exposure limits to diacetyl and similar food flavoring compounds within the workplace.

Long-standing research on mineral fibers has had national and international impact. ERC faculty members have undertaken a 30 year longitudinal study (1980, 2004, 2010) on exposure to vermiculite that contained Libby amphibole asbestos in an expander facility in Marysville, Ohio. The US EPA has worked closely with the Cincinnati faculty in using these data for an upcoming reference standard for Libby amphibole. The studies show effects at very low cumulative exposure levels. There are about 240 communities in the U.S. directly impacted by Libby amphibole as Libby vermiculite was transported to these sites for further processing. Further, the expanded vermiculite has been used in home insulation throughout the United States.

In a 25 year longitudinal study by ERC faculty and students on refractory ceramic fibers (RCF), results of chest radiographs and pulmonary function tests that were correlated to cumulative RCF exposure have been used by the European Union to set an exposure guideline for RCF.

Recent results on potential health hazard from exposure to the fibrous mineral erionite among gravel pit and road workers in North Dakota have raised concerns and awareness of potential respiratory health effects. The US Geological survey has invited an ERC faculty member to the expert panel to assess the potential health risk of gravel roads containing erionite as well as other naturally occurring mineral that are found throughout the Western U.S.

Continuing Education

A continuing education course on office ergonomic course was offered to trainees at the NASA Lewis Research Center in Cleveland, Ohio. The Training included the basic ergonomic principles, best ergonomic practices for office environments, and current state of office ergonomics interventions. The trainees were better equipped to set-up their work station properly and identify the potential factors that may lead to detrimental health effects in the future.